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ABSTRACT

While the relationships between health behavior and health status and between health status and perceived quality of life have received some attention, the association between health behaviors and quality of life has not been determined. The primary objective of this study was to assess the effects of health behaviors on quality of life that are independent of health status. A sample of approximately 5,000 randomly selected United States Navy personnel was split into halves and analyses performed on each to establish the replicability of the findings. At step one of a multiple regression procedure, health status variables were forced into the equation; next, health behavior variables were entered. As expected, the block of health status variables was significantly related to quality of life: self-assessed health and fitness status and lower reporting of physical symptoms accounted for 16% and 18% of the variance in quality of life for the two subsamples. After controlling for health status, two behavioral measures made unique contributions to the prediction of quality of life: behaviors related to avoiding unnecessary risks as a driver or pedestrian and avoiding or minimizing accidents. Wellness maintenance behaviors also were associated with quality of life in one subsample. After controlling for health status, health behavior measures contributed an additional 11% and 6% of the explained variance in quality of life for the two subsamples. The results suggest that health behaviors influence quality of life independently of health status. (Author)

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Impact of Health and Fitness-Related Behavior on Quality of Life

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Running Head: Health Behaviors and Life Quality

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Abstract

While the relationships between (a) health behavior and health status and (b) health status and perceived quality of life (QOL) have received some attention, the association between health behaviors and QOL has not been determined. The primary objective of this study was to assess the effects of health behaviors on QOL that are independent of the effects of health status. A sample of approximately 5,000 randomly selected U.S. Navy personnel was split into halves and analyses performed on each to establish the replicability of the findings. At step one of a multiple regression procedure, health status variables were forced into the equation; next, health behavior variables were entered. As expected, the block of health status variables was significantly related to QOL: self-assessed health and fitness status and lower reporting of physical symptoms accounted for 16% and 18% of the variance in QOL for the two subsamples. After controlling for health status, two behavioral measures made unique contributions to the prediction of QOL: behaviors related to avoiding unnecessary risks as a driver or pedestrian and avoiding or minimizing accidents. Wellness maintenance behaviors also were associated with QOL in one subsample. After controlling for health status, health behavior measures contributed an additional 11% and 6% of the explained variance in QOL for the two subsamples. Results indicate that health behaviors influence QOL independently of health status.

Enhancement of quality of life (QOL) and well-being among service members is a priority on the Navy agenda and is being pursued partly through health promotion efforts. The goal is to advance healthier life-style behaviors, and thereby, improve QOL (SECNAV, 1986). This approach is based on a model which assumes that modifiable health behaviors impact health status, which in turn influences QOL (Figure 1).

Insert Fig. 1 about here

Support can be found for subsets of this conceptual model. For example, investigations into the health behavior-health status relationship have grown out of the notion that, more than any other factor, an individual's behavior has a profound and direct impact on health status (Slater and Carlton, 1985). Although most studies in this area are not designed to confirm health behavior as a causative factor influencing health status, the cross-sectional findings are supportive. Several health and fitness-related behaviors (e.g., moderate drinking, smoking abstinence, physical activity, weight control, adequate sleep, seat belt use, and avoidance of high-risk sexual practices) have been reliably associated with higher subjective and functional health status (Rakowski, 1986; Stephens, 1986; Brock et al., 1988; Segovia et al., 1989; Lamb et al., 1988).

A second relational component of the model, the impact of health status on QOL, has also been examined. Several studies, usually using community samples, have found that physical health and life satisfaction are strongly correlated (Mechanic, 1980; Andrews et al., 1978; Frerichs et al., 1982; Schwab et al., 1978; Neff et al., 1980; Kathol and Petty, 1981). Further, Woodruff and Conway (1990a) reported reliable associations in a

group of U.S. Navy shipboard men between several QOL measures and health status variables such as lower reporting of psychosomatic symptoms and higher evaluations of health and fitness status.

While investigations continue into the health behavior-health status relationship and into the association between health status and QOL, assessments of the independent impact of health behaviors on QOL have been scarce. In a study of approximately 5,000 randomly selected U.S. Navy personnel, Woodruff and Conway (1990b) found moderate drinking and less smoking to be uniquely related to higher QOL, but the study did not examine health status and health behavior as distinct conceptual classes of predictors. A major purpose of the present study, in contrast, was to assess the effects of health behaviors on QOL which are independent of the effects of health status. To this end, analyses were performed to examine the extent to which a number of health and fitness-related behaviors significantly predicted QOL after controlling for several indicators of health status.

Method

Participants

Participants were 5,082 U.S. Navy personnel who were randomly selected in 1986 to be a part of a large study examining health-related life-style habits and attitudes toward health and fitness. The sample composition was similar to the overall Navy, consisting of 89% men and 11% women. The average age was 28 years (S.D.=7.0) with a range from 17 to 59 years. Ninety-six percent of the sample had at least 12 years of school compared to 94% of the total Navy. Enlisted personnel comprised 89% and officers 11% of the sample, which is also very similar to that of the Navy at large.

Procedure

Two types of data were collected: (a) self-report questionnaire data assessing perceptions of life quality, health and fitness status, and health and fitness-related behaviors and (b) results from a required Physical Readiness Test (PRT) assessing sailors' physical fitness and body composition (CNO, 1982). All personnel are required by Navy regulations to take the PRT unless they have a medical waiver. Command Fitness Coordinators (CFCs), who are Navy personnel assigned by each command to conduct the PRT, distributed and collected questionnaires from the selected individuals and provided PRT results for the same individuals.

Measures

Perceived QOL

Respondents completed 16 items adapted from Caplan et al., (1984). These items assessed life satisfaction/positive affect in a variety of areas such as health, personal accomplishments, interpersonal relationships, work, and life as a whole (see Appendix I for items). Wording of these items was based on items originally developed by Andrews and Withey (1976). Item responses were presented in a 7-point Likert format with response choices that ranged from terrible (1), unhappy (2), mostly dissatisfied (3), mixed (4), mostly satisfied (5), pleased (6), to delighted (7) (see also Andrews and Withey, 1976). A mean of the QOL items was used as a measure of overall QOL. The internal consistency of this scale based on Cronbach's alpha was .91.

Health and Fitness Status

Health status. A two-item scale was used to assess subjective ratings of health. One of these items asked respondents to rate their current health on a 5-point scale from poor (1) to excellent (5); the other asked

the extent to which their health had been what they wanted it to be and used a 5-point scale ranging from not at all (1) to a great deal (5). Cronbach's alpha for this scale was .78.

Fitness status. A two-item scale was used to measure subjective ratings of current physical fitness. One of these items asked respondents to rate their current physical fitness on a 5-point scale from poor (1) to excellent (5). The second item asked the extent to which their physical fitness had been what they wanted it to be and used a 5-point scale ranging from not at all (1) to a great deal (5). Cronbach's alpha for this scale was .75.

Weight status. Considering excess weight as a factor influencing one's health and fitness status, a scale based on perceptions of being overweight was also computed to assess one's propensity to weight problems. This scale was comprised of two items addressing whether one felt that he or she was currently overweight or had ever been overweight. Cronbach's alpha was .66.

Physical Symptoms. Participants completed a checklist of common physical symptoms associated with illness or injury. Individuals indicated the extent to which they experienced each symptom during the last 7 days using a 6-point Likert-type format ranging from did not experience (0) to experienced a great deal (5). Symptoms were cough, sore throat, flu, sinus problems, common cold symptoms, stomach problems, constipation, indigestion, diarrhea, nausea/vomiting, backaches, muscle aches or stiffness, muscle cramps, aching joints or bones, muscle sprain or strain, trouble concentrating, shortness of breath, pains in chest or heart, general tiredness, problems thinking clearly, tingling or numbness, and weakness. Scores were computed as the mean of the responses for all 22

symptoms. Cronbach's alpha for this scale was .92.

Physical Readiness Test Scores. Measures collected from the Navy's required PRT (see CNO, 1982 or Conway and Dutton, 1985) were used to compute an endurance fitness score. Two components of physical fitness were used: (a) cardiorespiratory endurance, measured as the time to complete a 1.5-mile run/walk and (b) muscular endurance, measured as the number of bent-knee sit-ups completed in a 2-minute period. An overall endurance fitness measure was computed by averaging the standardized scores on the two PRT measures. The standardized score for run/walk time was weighted by -1 prior to averaging with the standardized score for sit-ups so that higher values on both components would indicate higher endurance fitness. The internal consistency of this scale, based on Cronbach's alpha, was .64.

Health and Fitness-related Behavior

Health Behavior Dimensions. Participants completed a Health Behavior Checklist (see Vickers et al., 1990) indicating how well each of forty specific health behaviors described his or her usual behavior. Response options ranged from not at all like me (1) to very much like me (5). On the basis of findings that replicated across several independent samples, Vickers et al. (1990) described four distinct, replicable dimensions of health behavior which could be derived from 28 of the 40 items. These four dimensions are briefly described below, and the specific items comprising each dimension can be found in Appendix II. Scores were computed as the mean of the responses for items comprising each dimension.

Broadly speaking, the Wellness Maintenance and Enhancement (alpha=.78 in the present study) dimension represents actions that, if taken, could maintain or improve health. Traffic Risk (alpha=.56) represents behaviors

that involve risk taking, primarily as a pedestrian or driver. Accident Control (alpha=.70) encompasses behaviors related to avoiding or minimizing the effects of accidents and injuries. The fourth of the health behavior dimensions, Substance Use (alpha=.67), identifies behaviors pertaining to the use of substances that may adversely affect one's health (e.g., tobacco, alcohol, food additives). For this dimension, three other quantitative measures of substance use were combined with the four items from the Health Behavior Checklist. These three measures included a measure of alcohol consumption computed as the product of two responses: the average number of drinks consumed per day during the last week and the number of days on which one drank during that week. Caffeine consumption was computed as the sum of responses to questions regarding daily intake of cups or glasses of caffeinated coffee, tea, and soft drinks. A 10-category response measure of tobacco use was based on an item asking about the average number of cigarettes, cigars, and pipes smoked per day during the past week: 0, 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, 31-35, 36-40, and 41+. A Substance Use score was computed for each individual by averaging the standardized values for these seven substance variables. Where necessary, items were reverse-scored prior to computing the average so that a higher average value indicated higher substance use.

Exercise Activity. Because of recent interest in associations between exercise and psychological/cognitive variables, and because exercise has shown a tendency to be an outlier of health behavior clusters (Harris and Guten, 1979), it was included as a separate behavioral variable in the prediction of subjective life quality. An index of exercise activity was based on total kilocalories expended per week in nine types of physical activity: running, bicycling, swimming, playing racket sports, continuous

walking, performing aerobics, doing calisthenics, weight lifting, and playing basketball. Respondents reported the number of times per week they participated in each activity (frequency) and the number of minutes they generally spent in one workout period for each activity (duration). A rate of kilocalories expended per minute was assigned to each activity using the tables of energy expenditure in McArdle et al., (1986). The kilocalorie rate required for each minute of activity was multiplied by the total time in minutes per week that the participant reported engaging in each activity (frequency X duration). The resulting kilocalorie expenditure for each activity was then summed across all activities to provide a weekly estimate of exercise-related energy expenditure. This value was then used as an overall measure of exercise activity.

Statistical Analysis

To establish the stability of findings, the total sample was randomly split into halves, and analyses were performed on two subsamples of approximately 2,550 individuals each. A two-stage multiple regression procedure was performed on each subsample to examine the direct contribution of health and fitness behaviors to QOL, above and beyond that made by health and fitness status measures. The status variables were entered first into the regression equation as a block with a forced entry method so that they could function as a composite representing a global assessment of health status. In the second stage, the behavioral variables were similarly entered as a block. The amount of variance accounted for in each stage of the regression as well as the pattern of significant predictors were compared in the two subsamples to establish the replicability of the findings.

Results

A multiple regression analysis was performed for each subsample to assess the association between QOL and health behaviors after controlling for health status. (Appendix III presents means and bivariate correlations among all variables for the entire sample.) The first step of the analysis indicated, as expected, a significant association between the composite health status factor and QOL. Individual beta weights for the health status variables, as shown in Table I, revealed that three of the five variables made significant independent contributions to the prediction of QOL: lower reporting of physical symptoms and higher subjective ratings of health and fitness accounted for approximately 16% and 18% of the variance in overall QOL for the two groups. Weight status and endurance fitness did not make a significant contribution to the prediction of QOL in either subsample. The pattern of results in the two subgroups indicated a very high degree of replication of findings.

Insert Table I about here

The second step of the multiple regression analysis indicated that, after controlling for health and fitness status, two behavioral measures made unique contributions to the prediction of QOL: Traffic Risk and behaviors related to Accident Control (Table I). Such results indicated that individuals who avoid unnecessary risks as a driver or pedestrian and who take actions to avoid or minimize accidents reported higher QOL than their counterparts. Wellness Maintenance also was a significant predictor of QOL in one subsample, but did not replicate in the second subsample. After controlling for health and fitness status, health behavior measures

contributed an additional 11% and 6% of the total explained variance in QOL for the two subsamples.

Discussion

This study provides additional evidence that fitness and health status is related to subjective QOL. Similar to Woodruff and Conway's (1990a) findings from their study of Navy shipboard men, self-reported health and fitness status and lower reporting of physical symptoms were associated with higher QOL ratings in the present study. The robustness of this finding is further indicated by the replication of the pattern of health status predictors in two subsamples.

Interestingly, an objective measure of endurance fitness was only weakly associated with QOL (r=.06). One's perception of his/her fitness status, on the other hand, was a significant predictor of life satisfaction/QOL. It is also interesting to note that the perceived fitness scale and endurance fitness, as measured by the averaged PRT components, were only moderately associated (r=.33). Thus, self-perception of one's fitness status appears to be a function of other factors rather than simply objective fitness. These other factors would also appear to have a significant influence on perceived QOL that is not a function of objective fitness.

Weight status did not emerge as a predictor of overall QOL. Considering that overweight is viewed negatively in American society, it was expected that, due to social evaluation processes, those who rated themselves as overweight might also report lower QOL. However, most studies have found obesity to be either associated with **higher** levels of psychological well-being (perhaps due to physiological mechanisms) or not associated with psychological/satisfaction measures at all (Silverstone and

Solomon, 1966; Holland et al., 1970; Moore et al., 1962; Silverstone, 1968; Crisp and McGuiness, 1976; Kittel et al., 1978). Results here support previous studies finding no evidence that overweight status negatively influences psychological well-being and perceived QOL.

Beyond examining the relationship between health status and QOL, the primary purpose of this study was to examine the unique contribution of health and fitness behaviors to QOL over and above that made by health status. Results indicate that health behaviors influence QOL independently of health status. Specifically, findings showed that individuals who engage in behaviors associated with (a) avoiding accidents and injuries and (b) avoiding risk taking as a pedestrian or driver are also likely to report higher QOL. Replication of these results in two subsamples provided strong support for the stability of this pattern of behavioral associations with QOL. In addition, behaviors related to maintaining and enhancing health also were indicated as potentially important behaviors influencing overall QOL; however, this association needs to be replicated, as it was found in only one of the two subsamples examined in this study.

In summary, results from this study indicate that there is a general tendency for individuals who engage in positive health behaviors to report higher QOL independent of their health status. Although the contribution of health and fitness behaviors to QOL was somewhat modest (6-11%), the finding has positive implications for safety training and other health promotion efforts. The implication of the present findings is that health promotion interventions designed to improve life style and health behaviors may bring about independent improvements in QOL, irrespective of improvements associated with changes in health status. To the extent that Navy programs are effective in changing behavior, they may serve to enhance

perceived QOL directly, as well as indirectly, through improved health and fitness.

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Notes

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TABLE I

Regression analysis of health status and health behavior predicting QOL

	Beta Weights	
	Subsample 1 (n = 2,532)	Subsample 2 (n = 2,550)
Health and Fitness Status		
Health Status	.110*	.147*
Fitness Status	.127*	.191*
Weight Status	-.055	-.033
Physical Symptoms	-.177*	-.144*
Endurance Fitness	-.047	-.026
	R=.40	R=.43
	R^2=.16	R^2=.18
	$R^2\Delta$=.16**	$R^2\Delta$=.18**
Health and Fitness-Related Behaviors		
Wellness Maintenance	.082*	.031
Traffic Risk	-.094*	-.082*
Accident Control	.247*	.192*
Substance Use	.038	-.017
Exercise	.072	-.011
	R=.52	R=.49
	R^2=.27	R^2=.24
	$R^2\Delta$=.11**	$R^2\Delta$=.06**

* $p < .01$ ** $p < .001$

Appendix I

Quality-of-life items

1. How do you feel about your own personal life?
2. How do you feel about your wife/husband (or girlfriend/boyfriend)?
3. How do you feel about your romantic life?
4. How do you feel about your job?
5. How do you feel about the people you work with--your coworkers?
6. How do you feel about the work you do on the job--the work itself?
7. How do you feel about the way you handle problems that come up in your life?
8. How do you feel about what you are accomplishing in your life?
9. How do you feel about your physical appearance--the way you look to others?
10. How do you feel about your own health and physical condition?
11. How do you feel about yourself?
12. How do you feel about the extent to which you an adjust to changes in your life?
13. How do you feel about the kind of person you are?
14. How do you feel about your life as a whole?
15. Considering all things together, how content are you with your life as a whole?
16. To what extent has your life as a whole been what you wanted it to be?

Appendix II

Health behavior dimensions

Wellness Maintenance and Enhancement

1. I see a doctor for regular checkups.
2. I exercise to stay healthy.
3. I gather information on things that affect my health by watching television and reading.
4. I see a dentist for regular checkups.
5. I discuss health with friends, neighbors, and relatives.
6. I limit my intake of foods like coffee, sugar, fats, etc.
7. I use dental floss regularly.
8. I watch my weight.
9. I take vitamins.
10. I take health food supplements (e.g., protein additives, wheat germ, bran, lecithin).
11. I do things that will improve my health.

Traffic Risk

1. I cross busy streets in the middle of the block.
2. I take more chances doing things than the average person.
3. I speed while driving.
4. I take chances when crossing the street.
5. I carefully obey traffic rules so I won't have accidents. (reversed)
6. I cross the street against the light.
7. I engage in activities or hobbies where accidents are possible (e.g., motorcycle riding, skiing, using power tools, sky or skin diving, hang gliding, etc.).

Accident Control

1. I keep emergency numbers near the phone.
2. I destroy old or unused medicines.
3. I have a first aid kit in my home.
4. I check the condition of electrical appliances, the car, etc., to avoid accidents.
5. I fix broken things around my home right away.
6. I learn first aid techniques.

Substance Use

1. I do not drink alcohol. (reversed)
2. I don't take chemical substances which might injure my health (e.g., food additives, drugs, stimulants). (reversed)
3. I don't smoke. (reversed)
4. I avoid areas with high pollution. (reversed)

Appendix III

Means and Zero-order Correlation Coefficients among Quality of Life, Health Status, and Health Behavior Variables for a Navy Sample

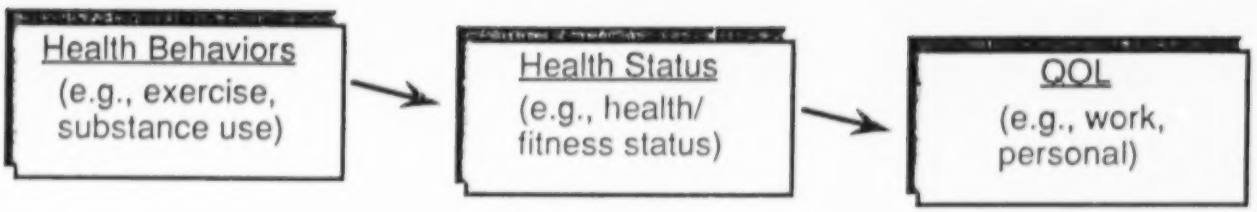
	QOL	HEALTH	FITNESS	WEIGHT	SYMPTOMS	ENDURANCE	WELLNESS	TRAFFIC	ACCIDENT	SUBSTANCE	EXERCISE
Mean	5.27	3.69	3.15	1.02	17.48	-.01	2.99	2.58	3.44	-.00	2162.91
SD	.83	.85	.85	.60	17.89	.87	.73	.78	.82	.58	1765.48
QOL	1.0000										
HEALTH	.3406**	1.0000									
FITNESS	.3320**	.6011**	1.0000								
WEIGHT	-.1453**	-.2135**	-.3908**	1.0000							
SYMPTOMS	-.2645**	-.2996**	-.1870**	.0777**	1.0000						
ENDURANCE	.0597*	.2053**	.3347**	-.2967**	-.0558*	1.0000					
WELLNESS	.2813**	.2616**	.3506**	-.1084**	-.1380**	.2123**	1.0000				
TRAFFIC	-.1827**	-.0453	-.0294	-.0034	.0854**	.1832**	-.1749**	1.0000			
ACCIDENT	.3411**	.1771**	.1663**	-.0230	-.0991**	-.0603*	.4169**	-.2671**	1.0000		
SUBSTANCE	-.1696**	-.2369**	-.1734**	.0190	.1564**	-.1477**	-.3905**	.2201**	-.2304**	1.0000	
EXERCISE	.1496**	.2144**	.3167**	-.1070**	-.0586*	.3454**	.3762**	.0939**	.1460**	-.1577**	1.0000

Note. QOL = Overall Quality of Life; HEALTH = Health Status; FITNESS = Fitness Status; WEIGHT = Weight Status; SYMPTOMS = Physical Symptoms; ENDURANCE = Endurance Fitness; WELLNESS = Wellness Maintenance and Enhancement; TRAFFIC = Traffic Risk; ACCIDENT = Accident Control; SUBSTANCE = Substance Use; EXERCISE = Exercise Activity.

* $p < .01$. ** $p < .001$ (two-tailed)

Figure Captions

Fig. 1. A conceptual model of the behavior, status, and QOL relationships


Health Behaviors
(e.g., exercise, substance use)
Health Status
(e.g., health/ fitness status)
QOL
(e.g., work, personal)